IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Lutz ASCHKE et al.		Group Art Unit	1756
Serial No.:	10/825,618	Examiner:	ROSASCO, Stephen D.

Filed: April 16, 2004

For: MASK BLANK FOR USE IN EUV LITHOGRAPHY AND METHOD FOR ITS PRODUCTION

DECLARATION UNDER §1.132

I, Robert Kuba, being duly warned, declare that:

My expertise for making this declaration is demonstrated in the attached Curriculum Vitae.

I am currently the business segment leader at Schott Lithotec, and I am responsible for the business segment, microlithography.

I am making this declaration based on test reports available from the Schott Lithotec's laboratory, which tests were performed prior to my involvement with this application. The persons who performed the tests are not available to sign the declaration. The test reports to my knowledge reflect truthfully the findings/results of the tests.

Test 1: Determination of the adhesive force of thin Cr-coatings on glass using the front end pull-off test for adhesion (Stirnabreisstest). The coating was achieved with magnetron sputtering, which is a conventional deposition technique.

Ten (10) units of coated glass substrates LQ1/LQ2 6025 ARC and two (2) units of coated glass substrates RLE 5009 2C were provided for determination of the adhesive force of the thin coatings.

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The determination of adhesive strength was carried out with the front end pull-off test for adhesion (Stirnabrisstest) in accordance with the German standard DIN EN 582 and/or the German standard DIN EN 24624.

In the afore-mentioned front end pull-off test (sometimes also called perpendicular-test), at least one test die and the substrate to be tested are bonded together using an adhesive. The coating to be tested faces towards the at least one test die. The compound consisting of the at least one test die and the substrate is then disconnected by applying a force perpendicular to the bonding interface. An indirect force transmission is dependent on the thickness of the substrate. In the test, the testing apparatus must satisfy the following requirements:

(1) The testing apparatus must be capable of generating traction forces exceeding 50 kN;
(2) the forces must be transmitted to the compound (consisting of the at least one test die and the substrate to be tested) without any substantial bending moment and torsional moment;
(3) the measurement is performed and the test data are recorded substantially without time-delay.

In the tests performed, it was ensured that the above requirements were satisfied.

The sample to be tested was carefully prepared in order to ensure

(1) that the respective test die and substrate (sample) to be tested were bonded together in a centred manner;
(2) that the desired contact pressure between the respective test die and the substrate to be tested was adjusted;
(3) that the adhesive strength between the respective die and the adhesive is larger than between the coating deposited onto the rear side of the substrate and the substrate;
(4) that the adhesive did not affect the rear side coating of the substrate.

Thus, the at least one test die is bonded perpendicularly onto the rear side of the substrate including the Cr-coating to be tested. A pull-off force is applied perpendicularly onto the at least one test die until disconnection occurs. The pull-off force is recorded.

TK

This test is fundamentally different to conventional peel-off tests where the coating to be tested is peeled off. Such conventional peel-off tests don't provide realistic information about the adhesive strength of coatings.

The maximum tensile force F_m when tearing off the coating was determined with the universal strength testing machine FPZ100. Using this result, the adhesive strength is then calculated according to the equation (1).

$$R_H = \frac{F_m}{A} \quad (1)$$

"A" being the pull-off area. The effective pull-off area was used and not, what is in some cases used, the diameter of the die. "A" is either the pull-off area or in some cases the diameter of the die. Using the effective pull-off area reflects the effective physical facts much better and more accurately when determines the adhesive strength. The effective pull-off area "A" has been determined with a reflected light microscope by using the image processing software PICED.

The adhesion between the coating and the die needed for determining the adhesive strength was realised with several cold-curing bonding agents (epoxy resin–bonding agents, acrylate-bonding agents, cyanoacrylate-bonding agents). The best results were achieved with the one component reaction adhesive based on cyanacrylate (superglue).

For each sample, the adhesive force was measured at five (5) points. Four (4) of these measuring points are located in a distance of approximately 25 mm from the corners of the glass panes. The fifth (5^{th}) measuring point is located in the middle of the sample. In addition to this, on two samples, the adhesive force was also determined along a line (drawn approximately 50 mm from the edge) at intervals of approximately 25 mm.

Except for one measuring point, the coating could not be torn off. The adhesive force of the coating in this case amounts to at least 160 N/mm². The sample from slot 9 of the series LQ1/LQ2 6025 ARC shows at one point a pronouncedly inferior adhesive force. It amounted to

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only 60 N/mm². This point is respectively located in a distance of 55 mm from the edge of the samples. Six (6) additional measurements of the adhesive force were conducted as close as possible to this point. In these points, the coating could also not be torn off. Therefore, the adhesive force around the located weak point amounts to at least 160 N/mm².

The test reveals that the adhesiveness is not uniform over the entire surface area tested because at one point the coating could be torn off or flaked off.

<u>Test 2:</u> Determination of the adhesive force of thin Cr-coatings on glass by testing of the resistance to abrasion with a cloth in accordance with German standard DIN 58196-5. The coating was deposited in accordance with the invention of the present application, namely with ion-beam-assisted sputtering/deposition.

Number of lifting operations: 25

Evaluation:	category	rating
	1	no deteriorations are recognizable at all
	2	a little scattered light, the abrasion traces are recognizable
	3	stronger scattered light, incipient partial deterioration slightly recognizable
	4	partial deteriorations are clearly recognizable
	5	the coating is stripped down to the substrate

All samples were rated category 2

Picture of deterioration Crock test

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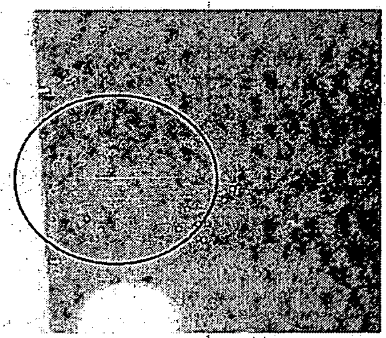

Test 3: Determination of the adhesive force of thin Cr-coatings on glass by testing of the resistance to abrasion with an eraser in accordance with German standard DIN 58196-4. The coating was deposited in accordance with the invention of the present application, namely with ion-beam-assisted sputtering/deposition.

Number of lifting operations: 20

Evaluation:	category	rating
	1.	no deteriorations are recognizable at all
	2.	a little scattered light, the abrasion traces are recognizable
	3.	stronger scattered light, incipient partial deterioration slightly recognizable
	4.	partial deteriorations are clearly recognizable
	5.	the coating is stripped down to the substrate

All samples were rated category 2

Picture of deterioration - eraser test

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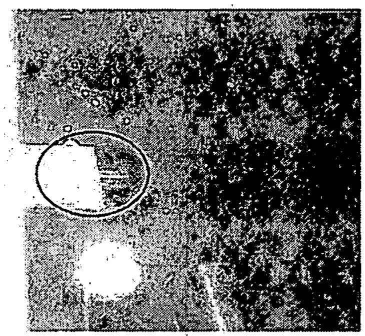

Test 4: Determination of the adhesive force of thin Cr-coatings on glass by testing of the resistance to abrasion with an adhesive tape in accordance with the German standard DIN 58196-6. The coating was deposited in accordance with the invention of the present application, namely with ion-beam-assisted sputtering/deposition.

Test according to intensity K2 (pulling off of the adhesive tape occurred within less than 1 second)

Evaluation: % peeling off of the taped surface

Results: all samples had 0% peeled off

In all of tests 2 to 4, testing a coating which has been deposited by ion-beam-assisted sputtering, the Chrome coating was not torn off or flaked off at any one point. Thus, the Chrome coatings in these cases were homogeneous. This was true even in the case of tests where the adhesive tape was torn off 20 or 25 times. Although test 1 is not the same as tests 2, 3, and/or 4, the latter three tests subject the samples to more rigorous treatment. Thus, samples which perform well in the latter three tests would perform well in test 1 also. Thus, the three coatings applied in tests 2-4 would perform significantly better in test 1 than that reported above.

These results are significant and unexpected in view of what is known in the prior art. One would not expect a coating deposited by ion-beam-assisted sputtering/deposition to be

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significantly more homogeneous in adhesion to a glass surface than a coating achieved with magnetron sputtering.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

March 30th 2007

Date

Dr.-Ing. Robert Kuba